**NAME: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ DATE: \_\_\_\_\_\_\_ PER. \_\_\_\_\_**

**ORGANISMS & pH**

**Background:** All organisms must maintain a steady pH in their tissues and blood. This is a key component in maintaining homeostasis. Most organisms maintain a pH in their tissues between 6.5 & 7.5. If the pH is too high or too low, this will greatly affect the functioning of the organism’s cells and the chemical reactions that take place. One way that organisms maintain pH in their tissues is by the use of buffers. Buffers are weak acids or bases that can react with strong acids or bases to prevent sharp, sudden changes in pH.

Remember that an acid is any solution that has an H+ concentration higher than that of pure water (pH of 7) and a base is any substance that has an H+ concentration lower than that of pure water. So, acids will have a pH of 0 – 6.9 and bases will have a pH of 7.1 – 13.0. A pH of 7.0 is considered neutral.

**Purpose**: In this lab you will test the pH of some biological substances both before and after the addition of hydrochloric (HCL) and sodium hydroxide (NaOH) – a base. You will then test the pH of a buffer solution by also adding HCL and NaOH.

**Materials**

50 ml beaker

50 ml graduated cylinder

pH paper with pH scale

0.1M HCL in dropper bottle

0.1 M NaOH in dropper bottle

pH Buffer (use the one on your table – record buffer number in data table

**SUBSTANCES TO BE TESTED:**

Tap water

Liver solution

Potato solution

Egg white solution

**PRELAB:** Based on the background information and any research, make a hypothesis about pH, biological materials and buffers.

**HYPOTHESIS:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**Procedure**:

1. Pour 25 ml of tap water into your beaker

2. Determine the pH of the tap water by dipping your pH paper into the water and comparing the color with the chart on the front of the pH paper dispenser.

3. Record this in your data table.

4. Add 5 drops of the 0.1 M HCL, swirling to mix.

5. Record the pH in your data table.

6. Repeat steps 4 & 5 until 30 drops have been added.

7. Repeat steps 1 – 6 for the 0.1M NaOH.

8. Repeats steps 1-6 for **EACH** of the biological materials.

9. Repeat steps 1-6 for the buffer solution.

**Results** –

1. Complete the data table below as directed in the “Procedure.” Make sure that you give your data table a title (the title should tell the reader exactly what is in the data table).

2. Graph the results for the changes in pH. Identify the Independent & Dependent variables below. Remember – Independent variable goes on the X-axis and the dependent variable goes on the Y. This will be a multi-line graph so you need to remember to include a key and use colored pencils. Please refer to the graphing reference notes handed out to you earlier. You will produce **TWO** graphs – 1 for HCL and 1 for NaOH.

a. Independent variable: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

b. Dependent variable: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **TESTS WITH HCL** | | | | | | | |
| **Solution** | **pH after addition of (drops)** | | | | | | |
|  | **0** | **5** | **10** | **15** | **20** | **25** | **30** |
| **Tap Water** |  |  |  |  |  |  |  |
| **Liver Solution** |  |  |  |  |  |  |  |
| **Potato** |  |  |  |  |  |  |  |
| **Egg White** |  |  |  |  |  |  |  |
| **Buffer** |  |  |  |  |  |  |  |

**TABLE 1:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

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|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **TESTS WITH NaOH** | | | | | | | |
| **Solution** | **pH after addition of (drops)** | | | | | | |
|  | **0** | **5** | **10** | **15** | **20** | **25** | **30** |
| **Tap Water** |  |  |  |  |  |  |  |
| **Liver Solution** |  |  |  |  |  |  |  |
| **Potato** |  |  |  |  |  |  |  |
| **Egg White** |  |  |  |  |  |  |  |
| **Buffer** |  |  |  |  |  |  |  |

**TABLE 2:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**CONCLUSION**:

1. What was the total pH change for the 30 drops of tap water for both the HCL and the NaOH?

2. What was the total pH change for each of the biological materials you tested (after 30 drops)?

|  |  |  |
| --- | --- | --- |
| **TOTAL pH CHANGE** | | |
| **Substance** | **HCL** | **NaOH** |
| **Liver Solution** |  |  |
| **Potato Solution** |  |  |
| **Egg White Solution** |  |  |
| **Buffer** |  |  |

3. Which substance had the greatest change in pH?

4. Which substance had the least amount of change in pH?

5. What would be the pH range of a substance that had a high H+ concentration?

6. What would be the pH range of a substance that had a low H+ (high OH-) concentration?

7. Why do buffers resist a change in pH?

8. If you have acid indigestion, what could you take to cure it? Why? (think of buffers).

9. What effect does a low pH have on lakes and rivers?

10. What is acid rain and why is it so harmful to organisms?